

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-238103

(43)Date of publication of application : 31.08.2001

(51)Int.CI.

H04N 5/225

G02B 7/02

H01L 27/14

H04N 5/335

(21)Application number : 2000-046523

(71)Applicant : MITSUBISHI ELECTRIC CORP

(22)Date of filing : 23.02.2000

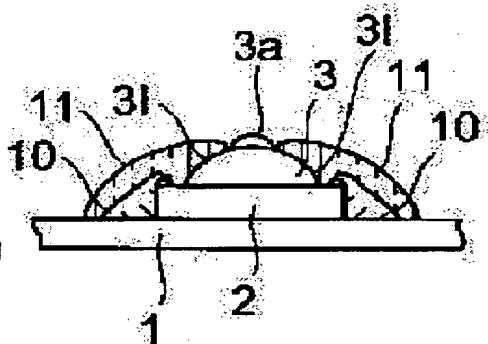
(72)Inventor : MIYAKE HIROYUKI

(54) IMAGING APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To integrate an integrated image pickup element, an optical element having an image forming lens and a casing and to miniaturize an imaging apparatus.

SOLUTION: An imaging apparatus has a substrate (1), an image pickup element (2) disposed on the substrate (1), an optical element (3) which is disposed on the image pickup element (2) and has at least one image forming lens part (3a), wires (10) which electrically connect the substrate (1) and the image pickup element (2) and a sealing resin (11) exposing the image pickup lens part (3a) and sealing the wires (10). The integrated image pickup element (2), the optical element (3) and the casing (1) are integrated and miniaturized by the sealing resin (11).



LEGAL STATUS

[Date of request for examination] 13.12.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3651577

[Date of registration] 04.03.2005

BEST AVAILABLE COPY

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.

3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The image pick-up equipment characterized by to have the case which has an image sensor, the optical element which has the image-formation lens section which carries out image formation of the light to this image sensor, and was united with the above-mentioned image sensor, the bond part which were prepared in the above-mentioned joint lens section side of this optical element, and the fixed part which forms opening in the part corresponding to the above-mentioned image-formation lens section, arranges this opening in the above-mentioned image-formation lens section, and fix the above-mentioned bond part.

[Claim 2] The above-mentioned bond part is image pick-up equipment according to claim 1 characterized by being the height of a configuration with a stage.

[Claim 3] Image pick-up equipment characterized by having the optical element united with the image sensor and the above-mentioned image sensor which has the image formation lens section which a projected part is prepared [section] and carries out image formation of the light on this projected part, and the case which formed the fitting section which inserts in the above-mentioned projected part while forming opening in the part corresponding to the above-mentioned image formation lens section.

[Claim 4] Image pick-up equipment according to claim 3 characterized by pasting up the above-mentioned projected part and the above-mentioned fitting section.

[Claim 5] Image pick-up equipment according to claim 3 characterized by arranging the infrared light clearance member which removes infrared light to the above-mentioned opening.

[Claim 6] Image pick-up equipment characterized by having the wire which connects electrically a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor and has at least one joint lens section, and the above-mentioned substrate and the above-mentioned image sensor, and closure resin which is made to expose the above-mentioned image formation lens section, and closes the above-mentioned wire.

[Claim 7] Image pick-up equipment according to claim 6 characterized by forming the appearance of the above-mentioned closure resin in the shape of a curved surface except for the above-mentioned image formation lens section.

[Claim 8] The image pick-up equipment characterized by to have the wire which connects electrically a substrate, the image sensor formed on this substrate, at least one image-formation lens section by which it was prepared on this image sensor and the appearance was established on a curved-surface-like transparency member and this transparency member, and the above-mentioned substrate and the above-mentioned image sensor, and closure resin which are made to expose the above-mentioned image-formation lens section, and close the above-mentioned wire.

[Claim 9] Image pick-up equipment characterized by having a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor, has at least one image formation lens section, and formed the front face in the shape of a taper, and the sealing agent which carries out the resin seal of the above-mentioned image sensor and the above-mentioned optical element except for the above-mentioned image formation lens section.

[Claim 10] Image pick-up equipment according to claim 9 characterized by forming irregularity in the

part of the shape of a taper of the above-mentioned optical element.

[Claim 11] Image pick-up equipment characterized by to have the 1st closure resin with the high thixotropy prepared in the lateral portion of a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor and has at least one image formation lens section, and the above-mentioned image sensor and the above-mentioned optical element, and closure resin of thixotropic low ** 2 prepared in the front face of the above-mentioned optical element except the above-mentioned image formation lens section.

[Claim 12] The image pick-up equipment characterized by to have a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor and has at least one image-formation lens section, the protection-from-light nature member which formed the crevice in the perimeter of the above-mentioned image-formation lens section of this optical element, and were arranged in this crevice, this protection-from-light nature member, and closure resin which close the front face of the above-mentioned optical element, and a side face and the side face of the above-mentioned image sensor continuously.

[Claim 13] Image pick-up equipment according to claim 12 characterized by preparing an infrared light clearance member so that it may connect with the above-mentioned protection-from-light nature member and the above-mentioned image formation lens section may be covered.

[Claim 14] Image pick-up equipment according to claim 12 characterized by having formed the top face of the above-mentioned protection-from-light nature member in the shape of a taper, having extracted it, and giving a function.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the image pick-up equipment which unified the image sensor and the optical element which has the image formation lens section, and its manufacture approach.

[0002]

[Description of the Prior Art] Conventionally, as this kind of image pick-up equipment, there were some which were indicated by JP,9-284617,A, for example. The optical element which becomes the official report from the image formation lens section and two or more legs is arranged on the CCD bare chip which is the image sensor laid on the substrate. By making those legs contact the corner of the top face of a CCD bare chip, it is constituted so that a relative position including the direction of a focus of the light-receiving side established in the image formation lens section and a CCD bare chip may turn into a predetermined location.

[0003]

[Problem(s) to be Solved by the Invention] However, in this conventional kind of image pick-up equipment, the fixed focus lens was used, and in order to secure relative-position precision including the direction of a focus of the image formation lens section and the light-receiving side on an image sensor, two or more legs needed to be prepared in the optical element. therefore, since lens structure is complicated and it is a package mold with conventional image pick-up equipment, a miniaturization is difficult -- being certain -- ** -- the technical problem to say occurred.

[0004] This invention aims at offering the new image pick-up equipment which is made in order to solve this technical problem, also unifies the optical element and case which have an image sensor and the image formation lens section, or carries out the resin seal of an image sensor and the optical element, and attains a miniaturization.

[0005]

[Means for Solving the Problem] The image pick-up equipment concerning claim 1 of this invention is equipped with the case which has an image sensor, the optical element has the image-formation lens section which carries out image formation of the light to this image sensor, and an optical element was united with the above-mentioned image sensor, the bond part which were prepared in the above-mentioned joint lens section side of this optical element, and the fixed part which form opening in the part corresponding to the above-mentioned image-formation lens section, arrange this opening in the above-mentioned image-formation lens section, and fix the above-mentioned bond part.

[0006] The image pick-up equipment concerning claim 2 of this invention is a thing according to claim 1 characterized by being the height of a configuration with a stage about the above-mentioned bond part.

[0007] The image pick-up equipment concerning claim 3 of this invention is equipped with an image sensor, the optical element united with the above-mentioned image sensor which has the image formation lens section which a projected part is prepared [section] and carries out image formation of the light on this projected part, and the case which formed the fitting section which inserts in the above-mentioned projected part while forming opening in the part corresponding to the above-mentioned image formation lens section.

[0008] The image pick-up equipment concerning claim 4 of this invention is a thing according to claim 3 characterized by pasting up the above-mentioned projected part and the above-mentioned fitting section.

[0009] The image pick-up equipment concerning claim 5 of this invention is a thing according to claim 3 characterized by arranging the infrared light clearance member which removes infrared light to the above-mentioned opening.

[0010] The image pick-up equipment concerning claim 6 of this invention is equipped with the wire which connects electrically a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor and has at least one joint lens section, and the above-mentioned substrate and the above-mentioned image sensor, and the closure resin which is made to expose the above-mentioned image formation lens section, and closes the above-mentioned wire.

[0011] The image pick-up equipment concerning claim 7 of this invention is a thing according to claim 6 characterized by forming the appearance of the above-mentioned closure resin in the shape of a curved surface except for the above-mentioned image formation lens section.

[0012] The image pick-up equipment concerning claim 8 of this invention is equipped with the wire which connects electrically a substrate, the image sensor formed on this substrate, at least one image-formation lens section by which it was prepared on this image sensor and the appearance was established on a curved-surface-like transparence member and this transparence member, and the above-mentioned substrate and the above-mentioned image sensor, and the closure resin which make expose the above-mentioned image-formation lens section, and close the above-mentioned wire.

[0013] The image pick-up equipment concerning claim 9 of this invention is equipped with a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor,

has at least one image formation lens section, and formed the front face in the shape of a taper, and the sealing agent which carries out the resin seal of the above-mentioned image sensor and the above-mentioned optical element except for the above-mentioned image formation lens section.

[0014] The image pick-up equipment concerning claim 10 of this invention is a thing according to claim 9 characterized by forming irregularity in the part of the shape of a taper of the above-mentioned optical element.

[0015] The image pick-up equipment concerning claim 11 of this invention is equipped with the 1st closure resin with the high thixotropy prepared in the lateral portion of a substrate, the image sensor formed on this substrate, the optical element which is prepared on this image sensor and has at least one image formation lens section, and the above-mentioned image sensor and the above-mentioned optical element, and the closure resin of thixotropic low ** 2 prepared in the front face of the above-mentioned optical element except the above-mentioned image formation lens section.

[0016] The image sensor with which the image pick-up equipment concerning claim 12 of this invention was formed on a substrate and this substrate, The optical element which is prepared on this image sensor and has at least one image formation lens section, A crevice is formed in the perimeter of the above-mentioned image formation lens section of this optical element, and it has the protection-from-light nature member arranged in this crevice, this protection-from-light nature member, and closure resin which closes the front face of the above-mentioned optical element, and a side face and the side face of the above-mentioned image sensor continuously.

[0017] The image pick-up equipment concerning claim 13 of this invention is a thing according to claim 12 characterized by preparing an infrared light clearance member so that it may connect with the above-mentioned protection-from-light nature member and the above-mentioned image formation lens section may be covered.

[0018] The image pick-up equipment concerning claim 14 of this invention is a thing according to claim 12 characterized by having formed the top face of the above-mentioned protection-from-light nature member in the shape of a taper, having extracted it, and giving a function.

[0019]

[Embodiment of the Invention] The gestalt 1 of implementation of this invention is explained using drawing 1 (a), (b), (c), (d), and (e). Image sensor and optical element of Saki who assembles unified image sensor and optical element which drawing 1 (a) requires for the appearance side elevation of that case the appearance top view and drawing 1 (b) which show the gestalt 1 of implementation of this invention, and drawing 1 (c) requires for the gestalt 1 of implementation of this invention, and a case, the sectional view of a case, the fragmentary sectional view after drawing 1 (d) assembles an image sensor and an optical element, and a case, and drawing 1 (e) are the sectional views of that whole configuration. In drawing 1 , it is the optical element which the image sensor with which 2 has a light sensing portion, and 3 have at least one image formation lens section 3a, and has 3g of heights formed in the isolated location with image formation lens section 3a, and this optical element 3 is united with an image sensor 2. 7 is a case incorporating the one apparatus image pick-up equipment unified combining the image sensor 2 and the optical element 3, and forms slot 7b of the structure corresponding to 3g of heights of opening 7a and an optical element 3, and the location which counters in a case 7 with this. As shown in drawing 1 (c) and (d), an image sensor 2 and an optical element 3 are unified, and fitting of the slot 7b of a case 7 is carried out to 3g of heights of an optical element 3, and it is unifying. At this time, image formation lens section 3a is carried out outside in ** so that it may enter into opening 7a of a case 7. Here, slot 7b of 3g of heights of an optical element 3 and a case 7 is taken as the configuration where it corresponded so that it might be fitted in and assembled. moreover, the configuration bent to the opposite hand with image formation lens section 3a in the periphery about the appearance of a case 7 as shown in drawing 1 (b) and (e) -- carrying out -- the bent edge -- the optical element 3 of an image sensor 2, the pars basilaris ossis occipitalis of an opposite hand, and abbreviation -- the same -- or it constitutes so that it may become outside a little. In addition, the configuration of the edge which the

above bent is made into the circle configuration.

[0020] Drawing 2 (a) and (b) are the front views and side elevations showing the gestalt 2 of implementation of this invention, respectively. Moreover, drawing 3 R> 3 (a) and (b) are the front views and side elevations showing the gestalt 3 of implementation of this invention, respectively. Let 3g of heights on an optical element 3 be a square in drawing 2. He is what considered 3g of heights on an optical element 3 as the square-like two-step configuration, and is trying for opening 7a of a case 7 which makes die length of one side small and does not illustrate an upside rather than the bottom to hit the top face of a lower square in drawing 3. for this reason, the height of a lower square is the same as the projection height of image formation lens section 3a -- or it forms highly a little. In addition, although not illustrated to drawing 2 and drawing 3, considering as a square is natural [the configuration of slot 7a of a case 7] so that it may correspond to 3g of heights.

[0021] Furthermore, implementation of this invention sticks gestalt 4 and it explains using drawing 4 R> 4 (a), (b), and (c). Drawing 4 (a) and (b) are the front views and side elevations of image pick-up equipment which are applied to the gestalt 1 of implementation of this invention, respectively. Drawing 4 (c) is the side elevation showing the configuration when adding the case of the image pick-up equipment concerning the gestalt 1 of implementation of this invention. In drawing 4, the same sign as drawing 1 etc. shows the same or a considerable part. In drawing 4, 3g of two or more heights formed on an optical element 3 is prepared.

[0022] Thus, according to the gestalten 2 and 3 of these operations, or 4, it can constitute so that the image pick-up equipment which unified the image sensor 2 and the optical element 3 may not rotate to a case 7. Moreover, slot 7b of 3g of heights on an optical element 3 and a case 7 may paste up the part by which fitting is carried out, and may unify. In addition, with the gestalt of these operations, although slot 7b was prepared on the case 7, 3g of optical element 3 convex sections is not restricted to it, and the cross-section configuration of 3g of heights does not restrict them to O mold and ** mold, either.

[0023] Thus, since the components for including in a case 7 are uniting the image pick-up equipment concerning the gestalt 1 of implementation of this invention thru/or 4 with an optical element 2, saving parts becomes possible and an assembly with a case 7 becomes easy. Moreover, what is necessary is just to connect the interface of the signal system for necessarily not fixing on a substrate the image sensor which was unified according to the image pick-up equipment which relates to the gestalt 1 of implementation of this invention although it is independently arranged with the case if, as for image pick-up equipment, an image sensor and an optical element are generally fixed on a substrate and it says strictly, and an optical element, and carrying out the exchange of actuation of image pick-up equipment, or signal processing. Therefore, -izing of the fixed part for fixing an image sensor can be carried out [space-saving] to a substrate, and amplification of miniaturization / design degree of freedom can be realized.

[0024] Next, the gestalt 5 of implementation of this invention is explained using drawing 5 R> 5 (a), (b), and (c). Drawing 5 (a) and (b) are the front views and side elevations of image pick-up equipment which are applied to the gestalt 5 of implementation of this invention, respectively. the side elevation showing a configuration when drawing 5 (c) adds the case of the image pick-up equipment concerning the gestalt 5 of implementation of this invention -- and it is an enlarged drawing a part. In drawing 5, the same sign as drawing 1 shows the same or a considerable part. As shown in drawing 5 (a) and (b), an optical element 3 has 3h of lobes, and forms image formation lens section 3a on 3h of lobes. 3h of this lobe is inserted in checking-and-verifying section 7c formed in the inside in the periphery of opening 7a of a case 7 as shown in drawing 5 (c). the height of the part which projects inside the case 7 for forming checking-and-verifying section 7c at this time -- the height of 3h of lobes, and abbreviation -- suppose that it is the same or a little low.

[0025] In drawing 5 (c), 8 is adhesives, was prepared between 3h of lobes of the part which projects inside a case 7, and an optical element 3 etc., and has realized unification for the optical element 3 and the case 7. Moreover, as shown in drawing 5 (c), opening 7a has faced image formation lens section 3a

outside. Thus, when the unified image sensor 2 and the unified optical element 3 are included in a case 7, a relative position with a case 7 is decided, and the activity at the time of an assembly becomes easy. Moreover, since an optical element 3 becomes a configuration with a stage by preparing 3h of lobes on an optical element 3, the relative position of the height direction is also decided. In addition, in an image pick-up equipment product, although that relative position is important in order that, as for the relative-position relation between image formation lens section 3a on an optical element 3, and opening 7a on a case 7, image pick-up equipment may incorporate a photographic subject as optical information, with the gestalt 5 of this operation, that alignment can be made easy.

[0026] Next, the gestalt 6 of implementation of this invention is explained using drawing 6 R> 6 (a) and (b). Drawing 6 (a) and (b) are the partial expanded sectional views of the image pick-up equipment applied to the gestalt 6 of implementation of this invention, respectively. In drawing 6 (a) and (b), the same sign as drawing 5 R> 5 shows the same or a considerable part. Although the image pick-up equipment shown in drawing 6 is the same as that of what is shown in drawing 5 (c) fundamentally, the place by which it is characterized formed 7d of notches in the case 7 in the periphery section of image formation lens section 3a, and has equipped with the infrared light clearance member 9 which has an infrared light clearance function in 7d of this notch. The periphery section of opening 7a of a case 7 is formed in taper configuration 7e so that it may have the drawing effectiveness of incident light. With the gestalt 6 of this operation, it combines by fitting section 7c prepared in the case 7 corresponding to 3h of lobes and it which were prepared in the periphery section of image formation lens section 3a of an optical element 3, and that fitting section is further fixed with adhesives 8, and unification and immobilization are carried out for the unified optical element 3 and the unified image sensor 2 to the case 7.

[0027] The image pick-up equipment applied to the gestalt 6 of this operation by doing in this way Since an optical element 3 is united with a case 7 through adhesives 8, when the external force which is going to push in an optical element 3 inside a case 7 from the outside of opening 7a of a case 7 by a certain cause works, Since the external force is absorbed by the adhesive strength of the adhesives 8 of an optical element 3 and a case 7, it can ease the impact which joins the image sensor 2 by external force directly. Moreover, drawing 6 (b) has the drawing effectiveness over incident light by taper configuration 7e in the periphery section of opening 7a of a case 7. Thus, while extracting to an image pick-up equipment side, and it becoming unnecessary to give a function and reducing the manday of image pick-up equipment by extracting on the case of the product with which image pick-up equipment is incorporated, and giving a function, -izing of the process quality can be improved and carried out [low cost].

[0028] Moreover, since the plate which has the infrared light clearance effectiveness in opening 7a of a case 7 is arranged, while it becomes unnecessary to form an infrared light clearance means in an image pick-up equipment side and reducing the production manday of image pick-up equipment, -izing of the process quality can be improved and carried out [low cost]. That is, a quality fluctuation element carries out saving parts of the components mark of a large optical element one apparatus image pick-up equipment process, and while carrying out a manday cutback, a defect generating opportunity can be decreased and it can be raised [process quality is stable and]. In addition, the components 9 which have an infrared light clearance function may be used as a hard ingredient. When the external force which is going to push in an optical element 3 inside a case 7 from the outside of opening 7a of a case 7 by a certain cause works by that cause, while being able to mitigate the load given to image pick-up equipment, it can prevent a blemish etc. occurring in image formation lens section 3a of an optical element 3.

[0029] Next, the gestalt 7 of implementation of this invention is explained using drawing 7 R> 7. Drawing 7 is the block diagram showing the configuration of the image pick-up equipment concerning the gestalt 7 of implementation of this invention. In drawing 7, the optical element in which a substrate and 2 have an image sensor and, as for 3, 1 has at least one image formation lens section 3a, the golden wire with

which 10 connects an image sensor 2 with a substrate 1 electrically by wire bonding, and 11 are closure resin which closes the golden wire 10. An image sensor 2 is mounted on a substrate 1, and is electrically connected by the golden wire 10 by the wire-bonding approach. Although temporary immobilization of the optical element 3 is carried out by adhesives on an image sensor 2, it is unified and fixed on a substrate with closure resin 11.

[0030] If it is made such a configuration, an image sensor 2, and unification and a miniaturization are [an optical element 3] realizable, being able to protect image pick-up equipment from moisture absorption and foreign matter penetration with closure resin 11, and also having the function of protection to external force. In addition, closure resin 11 is good also as resin of protection-from-light nature. Then, the above-mentioned effectiveness can be attained and also penetration of the beam of light from other than image formation lens section 3a to the light-receiving side on an image sensor 2 can be prevented. The components which have a PAKEJI function are made unnecessary and saving parts and a miniaturization also become possible. Moreover, it does not limit the construction material of the closure resin used, the gestalt 7 of implementation of this invention is [resiliency being / of a silicon system / resin, or] possible, for example, the rigid resin of an epoxy system is possible for it. The approach of constituting closure resin may not be restricted, either, and you may constitute from a dispensing approach, for example, may constitute by the shaping approach. Although the configuration in which the substrate 1 was electrically connected with the image sensor 2 by the golden wire 10 was described, it does not restrict to a golden wire, either.

[0031] Moreover, in drawing 7, the appearance of the closure resin 11 except image formation lens section 3a on an optical element 3 is formed in the shape of a curved surface. For example, when were constituted using liquefied protection-from-light nature closure resin and there was the edge section which was square on the front face of an optical element 3, closure resin 11 flowed and fell bordering on the edge section, and there was a problem that where of the thickness of closure resin 11 became thin, near [the] the edge section passed closure resin 11 from the edge section of an optical element 3, and light penetrated it on an image sensor 2 as development. However, since there is no edge section in which the above-mentioned was square in the configuration of closure resin 11 by making the appearance surface sections other than image formation lens section 3a of an optical element 3 into a smooth curve configuration like drawing 7, the thickness of closure resin 11 cannot become thin selectively, and a protection-from-light function can also be maintained.

[0032] Next, the gestalt 8 of implementation of this invention is explained using drawing 8, drawing 9 (a), (b), (c), drawing 10, drawing 11 (a), and (b). The block diagram showing the configuration of the image pick-up equipment which drawing 8 requires for the gestalt 8 of the operation to this invention, drawing 9 (a), (b), and (c) are the top views, front views, and side elevations of the optical element concerning the gestalt of implementation of this invention. The block diagram showing another configuration of the image pick-up equipment which drawing 10 requires for the gestalt 8 of implementation of this invention, drawing 11 (a), and (b) are the side elevations which added the top view and the elements on larger scale of image pick-up equipment concerning the gestalt 8 of implementation of this invention, respectively. In drawing 8, drawing 9 (a), (b), (c), drawing 10 R>0, drawing 11 (a), and (b), the same sign as drawing 7 shows the same or a considerable part. It sets to drawing 8 and drawing 10, and the description is that it set surface appearance parts other than image formation lens section 3a of an optical element 3 to smooth surface configuration 3I. Moreover, in drawing 10 10, umbrella configuration 3J are formed in an optical element 3 so that the wirebonding section may be covered. Moreover, it sets to drawing 11 (a) and (b), and is considering as the configuration in which TEOA configuration 3K which had dip in surface appearance parts other than image formation lens section 3a of an optical element 3 were formed.

[0033] In drawing 8, the curved-surface configuration with the radius of circle which eliminated the edge section which was square as shown in drawing 9 (a), (b), and (c) is made to the appearance surface sections other than image formation lens section 3a of an optical element 3. Carrying out temporary

immobilization of the optical element 3, and closing the electrical coupling section with closure resin 11 on the image sensor 2 electrically connected with the substrate 1 with wire bond, an optical element 3 is unified and fixed with a substrate 1 and an image sensor 2, and image pick-up equipment is constituted. Although there was the same problem as the gestalt 7 of operation when the image pick-up equipment concerning the gestalt 8 of implementation of this invention was also constituted using liquefied protection-from-light nature closure resin If there is the edge section which was square on the front face of an optical element 3, closure resin 11 will flow and fall bordering on the edge section. There was a problem that the thickness of closure resin 11 became thin, near [the] the edge section passed closure resin 11 from the edge section of an optical element 3, and light penetrated it on an image sensor 2 as development. However, by making the appearance surface sections other than image formation lens section 3a of an optical element 3 into a smooth curve configuration for an optical element 3 like drawing 9 , for an inside reason, the thickness of closure resin cannot become thin selectively and the edge section in which the above-mentioned way was square can also maintain a protection-from-light function.

[0034] Moreover, if the edge angle in a part for the hem part of taper configuration 3k of an optical element 3 is enlarged in near the top-face corner of an image sensor 2 as shown in drawing 11 (a), the thickness can ease becoming thin in the edge section, and the closure resin 11 of protection-from-light nature can maintain a protection-from-light function. As shown in the elements on larger scale of drawing 11 (b), detailed concavo-convex 3L is formed in surface appearance parts other than image formation lens section 3a of an optical element 3. By this, the flow resistance of the closure resin 11 in the front face of an optical element 3 can be given, the outflow of closure resin 11 can be prevented, generating of shade dispersion by closure resin 11 can be lessened, and a protection-from-light function can be raised.

[0035] Moreover, in drawing 11 (b), although concavo-convex 3L of an optical element 3 was formed stair-like, the means of others which may not restrict to it, and may make it the shape of grinding, such as grinding glass, for example, prepare the flow resistance of a fluid in the interface of closure resin 11 and an optical element 3 may be used. Moreover, at the time of formation of the resin seal section, it is liquefied, and after hardening may prepare at it umbrella configuration 3J which cover the golden wire 10 using the closure resin of an elastic silicon system. If it does in this way, even when using elastic closure resin, by umbrella configuration 3J of an optical element 3, the protection feature from external force can be strengthened for the golden wire 10, and the reinforcement to external force can be raised. In addition, when using hard closure resin, product reliability can be improved as for umbrella configuration 3L.

[0036] Next, the gestalt 9 of implementation of this invention is explained using drawing 12 . Drawing 12 is the block diagram showing the configuration of the image pick-up equipment concerning the gestalt 9 of implementation of this invention. In drawing 12 R> 2, that the same sign as drawing 11 is the same, or in order to show a considerable part, those explanation is omitted. In drawing 12 , closure resin 11 consists of thixotropic high closure resin 11a and closure resin 11b of low clay. Thixotropy is high, the top-face part of an optical element 3 has thixotropy lower than closure resin 11a by hyperviscous closure resin 11a, and the part until it results [from the top-face corner of an optical element 3] in a substrate 1 the closure resin 11 which is uniting the optical element 3 and the image sensor 2 with a substrate 1 consists of closure resin 11b of hypoviscosity. If it does in this way, for high thixotropy and hypoviscosity, closure resin 11a can maintain the configuration of closure resin itself, and the closure resin section does not flow out but it can maintain a protection-from-light function. In addition, the closure resin of high thixotropy is sufficient also as closure resin 11b.

[0037] Next, drawing 15 is used and explained to the drawing 13 (a), (b) and drawing 14 (a), and (b) list about the image pick-up equipment concerning the gestalt 10 of implementation of this invention. The side elevation which added the front view and partial enlarged drawing of image pick-up equipment which drawing 13 (a), (b), and drawing 14 (a) and (b) require for the gestalt 10 of this operation, and drawing 15

are the elements on larger scale showing another example about the part equivalent to drawing 14 (b). In drawing 13 and drawing 14, that the same sign as drawing 12 is the same, or in order to show a considerable part, those explanation is omitted. 3m of crevices is formed in the appearance section in the pole periphery section of image formation lens section 3a of an optical element 3 in drawing 13 and drawing 14. The components 12 of protection-from-light nature are arranged to 3m of crevices formed in the optical element 3 in drawing 14. The components 12 of this protection-from-light nature form configuration 12a which has a drawing function to incident light, as shown in the elements on larger scale of drawing 14 (b). Moreover, in drawing 15, the components 12 of protection-from-light nature are arranged near the perimeter of image formation lens section 3a of an optical element 3, and fitting of the components 9 which have an infrared light clearance function on the components 12 of the protection-from-light nature is carried out.

[0038] Thus, in drawing 13, 3m of crevices is established in the pole periphery section of image formation lens section 3a of an optical element 3, and closure resin 11 is unifying and fixing the optical element 3, the image sensor 2, and the substrate 1. In case closure resin 11 is applied to an optical element 3 at this time, in order that it may be distorted or the configuration in near image formation lens 3a of an optical element 3 may prevent the nonconformity of adhering on the lens side of image formation lens section 3a to the peripheral shape of image formation lens section 3a by dispersion in coverage, as shown in drawing 13 (a) and (b), 3m of crevices established in the optical element 3 is covered with closure resin 11, and the section is formed. Therefore, the spreading configuration of closure resin 11 can close the periphery section of image formation lens section 3a of an optical element 3 to accuracy, and adhering on the lens side of image formation lens section 3a can also be prevented.

[0039] Moreover, in drawing 14, it corresponds to 3m of crevices shown in drawing 13 with the configuration, and fitting assembly of the components 12 of the protection-from-light nature of the dimension in which a fitting assembly is possible is carried out, contacting an optical element 3 at 3m of crevices. In this way, the spreading configuration of closure resin 11 does not affect the peripheral shape of image formation lens section 3a of an optical element 3, but the pole periphery section of image formation lens section 3a can make spreading of closure resin 11 ease and the stable quality while it is shaded certainly and it can prevent certainly adhesion of up to [the lens side of image formation lens section 3a of closure resin 11] with the components 12 of protection-from-light nature. Moreover, as shown in the elements on larger scale of drawing 14 (b), the drawing function of incident light is prepared by making into a configuration like 12a the periphery section of image formation lens 3a in the components 12 of protection-from-light nature, and the part which is approaching.

[0040] In addition, although the components 9 which have components 12a of the protection-from-light nature which has a drawing function, and the infrared clearance effectiveness were formed independently, those both may consist of gestalten 10 of this operation. If it carries out like this, when it unifies and fixes an optical element 3, image pick-up equipment 2, and a substrate 1 with closure resin 11, it can produce without spoiling the optical engine performance in the periphery section of image formation lens 3a with the closure resin 11, and can also have the effectiveness in the case of the gestalt 7 of operation.

[0041]

[Effect of the Invention] According to the image pick-up equipment concerning claim 1 of this invention, the image sensor and optical element which were unified can be united with the above-mentioned case by the bond part prepared in the joint lens section side of an optical element, and the fixed part prepared in the case.

[0042] According to the image pick-up equipment concerning claim 2 of this invention, since the configuration with a stage was formed in the above-mentioned height, relative-position doubling of the image formation lens section of an optical element and opening of a case becomes easy.

[0043] According to the image pick-up equipment concerning claim 3 of this invention, the image

formation lens section is prepared in the projected part formed in the optical element, and relative-position doubling of the image sensor and optical element which were unified from having considered as the configuration which inserts the above-mentioned projected part in the fitting section of a case, and a case becomes easy.

[0044] The image pick-up equipment concerning claim 4 of this invention can carry out the unification with the image sensor and optical element which were unified easily, and a case by pasting up the above-mentioned projected part and the above-mentioned fitting section.

[0045] The image pick-up equipment concerning claim 5 of this invention can remove infrared light effectively by preparing opening in the part corresponding to the above-mentioned image formation lens section of the above-mentioned case, and arranging the infrared light clearance member which removes infrared light to this opening.

[0046] The image pick-up equipment concerning claim 6 of this invention arranges the optical element which has the joint lens section in the image sensor on a substrate, since it connects electrically with a wire and carries out the resin seal of the above-mentioned substrate and the above-mentioned image sensor, can prevent moisture absorption and foreign matter penetration, and can unify and fix an image sensor and an optical element at a substrate.

[0047] Except for the above-mentioned image formation lens section, from having made the appearance of the above-mentioned closure resin into the curved-surface configuration, the thickness of closure resin does not become thin selectively and the image pick-up equipment concerning claim 7 of this invention can maintain a protection-from-light function.

[0048] From preparing at least one image formation lens section in the transparency member of the shape of a curved surface established on the image sensor on a substrate, connecting electrically the above-mentioned substrate and the above-mentioned image sensor with a wire, exposing the above-mentioned image formation lens section, and carrying out the resin seal of the above-mentioned wire, the thickness of closure resin does not become thin selectively and the image pick-up equipment concerning claim 8 of this invention can maintain a protection-from-light function.

[0049] Since the image pick-up equipment concerning claim 9 of this invention prepared the optical element in which the taper section was formed so that the wirebonding section might be covered to the image sensor on a substrate, and it carried out the resin seal of the above-mentioned image sensor and the above-mentioned optical element of a surface part except the image formation lens section of this optical element, it can raise the reinforcement to the external force in the wirebonding section, and can raise the dependability of a product.

[0050] Since the image pick-up equipment concerning claim 10 of this invention formed irregularity in the part of the shape of a taper of the above-mentioned optical element, it can prevent the outflow of closure resin, can lessen generating of shade dispersion by closure resin, and can raise a protection-from-light function.

[0051] Since the image pick-up equipment concerning claim 11 of this invention prepared the 1st closure resin with high thixotropy in the lateral portion of the image sensor on a substrate, and the optical element which has the image formation lens section and prepared the 2nd thixotropic low closure resin in the front face of the above-mentioned optical element except the above-mentioned image formation lens section, it can maintain the configuration of closure resin itself.

[0052] Since the image pick-up equipment concerning claim 12 of this invention forms a crevice in the perimeter of the image formation lens section of an optical element, arranges a protection-from-light nature member in this crevice and closes the front face of the above-mentioned optical element, and a side face and the side face of the above-mentioned image sensor with closure resin, it can close certainly the periphery section of the above-mentioned image formation lens section, and can give the drawing function of incident light.

[0053] Since the image pick-up equipment concerning claim 13 of this invention prepared the infrared light clearance member so that the image formation lens section of an optical element might be covered,

it can remove infrared light effectively.

[0054] Since the image pick-up equipment concerning claim 14 of this invention formed the top face of the protection-from-light nature member in the periphery section of the image formation lens section of an optical element in the shape of a taper, it can give a drawing function.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Image sensor and optical element of Saki who assembles unified image sensor and optical element which (a) requires for the appearance side elevation of that case the appearance top view showing the gestalt 1 of implementation of this invention and (b), and (c) requires for the gestalt 1 of implementation of this invention, and a case, the sectional view of a case, the fragmentary sectional view after (d) assembles an image sensor and an optical element, and a case, and (e) are the sectional views of that whole configuration.

[Drawing 2] (a) and (b) are the front views and side elevations showing the gestalt 2 of implementation of this invention, respectively.

[Drawing 3] (a) and (b) are the front views and side elevations showing the gestalt 3 of implementation of this invention, respectively.

[Drawing 4] The front view of the image pick-up equipment which (a) and (b) require for the gestalt 1 of implementation of this invention, respectively and a side elevation, and (c) are the side elevations showing the configuration when adding the case of the image pick-up equipment concerning the gestalt 1 of implementation of this invention.

[Drawing 5] the side elevation showing a configuration when the front view of the image pick-up equipment which (a) and (b) require for the gestalt 5 of implementation of this invention, respectively and a side elevation, and (c) add the case of the image pick-up equipment concerning the gestalt 5 of implementation of this invention -- and it is an enlarged drawing a part.

[Drawing 6] (a) and (b) are the partial expanded sectional views of the image pick-up equipment applied to the gestalt 6 of implementation of this invention, respectively.

[Drawing 7] It is the block diagram showing the configuration of the image pick-up equipment concerning the gestalt 7 of implementation of this invention.

[Drawing 8] It is the block diagram showing the configuration of the image pick-up equipment concerning the gestalt 8 of implementation of this invention.

[Drawing 9] (a), (b), and (c) are the top views, front views, and side elevations having shown the appearance of the optical element concerning the image pick-up equipment shown in drawing 8, respectively.

[Drawing 10] It is the block diagram showing the configuration of the image pick-up equipment

concerning the gestalt 8 of implementation of this invention.

[Drawing 11] (a) and (b) are the side elevations which added the top view and the elements on larger scale of image pick-up equipment concerning the gestalt 8 of implementation of this invention, respectively.

[Drawing 12] It is the block diagram showing the configuration of the image pick-up equipment concerning the gestalt 9 of implementation of this invention.

[Drawing 13] (a) and (b) are the side elevations which added the front view and partial enlarged drawing of image pick-up equipment which start the gestalt 10 of this operation, respectively.

[Drawing 14] (a) and (b) are the side elevations which added the front view and partial enlarged drawing of image pick-up equipment which start the gestalt 10 of this operation, respectively.

[Drawing 15] It is the elements on larger scale showing another example about the part equivalent to drawing 14 (b).

[Description of Notations]

1 [-- The image formation lens section 3g / -- Heights,] -- A substrate, 2 -- An image sensor, 3 -- An optical element, 3a 3h [-- Irregularity, 3m / -- Crevice,] -- A lobe, 3J -- An umbrella configuration, 3k -- The taper section, 3L 7 [-- The fitting section, 7d / -- A notch, 8 / -- Adhesives, 9 / -- An infrared light clearance member, 10 / -- A golden wire, 11 / -- Closure resin, 11a / -- Hyperviscous closure resin, 11b / -- The closure resin of hypoviscosity, 12 / -- Protection-from-light nature / -- Components, 12a / -- Drawing configuration] -- A case, 7a -- Opening, 7b -- A slot, 7c

[Translation done.]

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2001-238103

(P2001-238103A)

(43)公開日 平成13年8月31日(2001.8.31)

(51)Int.Cl.⁷
H 04 N 5/225
G 02 B 7/02
H 01 L 27/14
H 04 N 5/335

識別記号

F I
H 04 N 5/225
G 02 B 7/02
H 04 N 5/335
H 01 L 27/14

テ-マコ-ト^{*}(参考)
D 2 H 0 4 4
B 4 M 1 1 8
V 5 C 0 2 2
D 5 C 0 2 4

審査請求 未請求 請求項の数14 O L (全 9 頁)

(21)出願番号 特願2000-46523(P2000-46523)

(22)出願日 平成12年2月23日(2000.2.23)

(71)出願人 000006013
三菱電機株式会社
東京都千代田区丸の内二丁目2番3号

(72)発明者 三宅 博之
東京都千代田区丸の内二丁目2番3号 三菱電機株式会社内

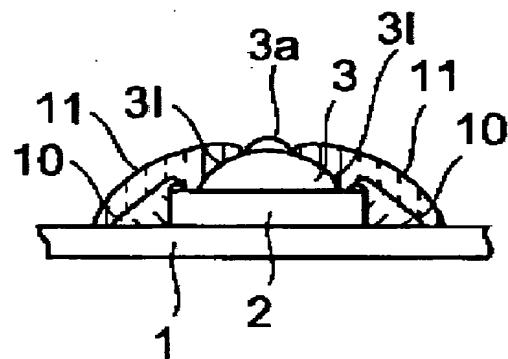
(74)代理人 100102439
弁理士 宮田 金雄 (外1名)
Fターム(参考) 2H044 AB02 AB10 AB18 AB25 AB28
4M118 AA10 AB01 CB01 CC11 GD03
GD07 HA03 HA05
5C022 AC42 AC54 AC77 AC78
5C024 AX01 BX01 CY48 CY49 EX22
EX24 EX25 EX42 EX51 GY01

(54)【発明の名称】 撮像装置

(57)【要約】

【課題】 この発明は、一体化した撮像素子及び結像レンズ部を有する光学素子と筐体とを一体化して撮像装置の小型化を図ることを目的とする。

【解決手段】 この発明に係る撮像装置は、基板(1)と、この基板(1)上に設けられた撮像素子(2)と、この撮像素子(2)上に設けられ、少なくとも1つの結像レンズ部(3a)を有する光学素子(3)と、基板(1)と撮像素子(2)とを電気的に接続するワイヤ(10)と、結像レンズ部(3a)を露出させてワイヤ(10)を封止する封止樹脂(11)とを備え、一体化した撮像素子(2)及び光学素子(3)と筐体(1)とを封止樹脂(11)により一体化・小型化を実現したものである。



(2)

2

【特許請求の範囲】

【請求項 1】 撮像素子と、この撮像素子に光を結像させる結像レンズ部を有し、上記撮像素子と一体化された光学素子と、この光学素子の上記結合レンズ部側に設けられた結合部と、上記結像レンズ部に対応する部分に開口部を形成し、この開口部を上記結像レンズ部に配置して上記結合部を固定する固定部を有する筐体とを備えたことを特徴とする撮像装置。

【請求項 2】 上記結合部は、段付き形状の突起部であることを特徴とする請求項 1 に記載の撮像装置。

【請求項 3】 撮像素子と、突部が設けられ、この突部上に光を結像させる結像レンズ部を有する上記撮像素子と一体化された光学素子と、上記結像レンズ部に対応する部分に開口部を形成するとともに、上記突部を嵌め込む嵌合部を形成した筐体とを備えたことを特徴とする撮像装置。

【請求項 4】 上記突部と上記嵌合部とを接着したこととを特徴とする請求項 3 に記載の撮像装置。

【請求項 5】 上記開口部に赤外光を除去する赤外光除去部材を配設したことを特徴とする請求項 3 に記載の撮像装置。

【請求項 6】 基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも 1 つの結合レンズ部を有する光学素子と、上記基板と上記撮像素子とを電気的に接続するワイヤと、上記結像レンズ部を露出させて上記ワイヤを封止する封止樹脂とを備えたことを特徴とする撮像装置。

【請求項 7】 上記結像レンズ部を除き、上記封止樹脂の外形を曲面状に形成したことを特徴とする請求項 6 に記載の撮像装置。

【請求項 8】 基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、外形が曲面状の透明部材と、この透明部材上に設けられた少なくとも 1 つの結像レンズ部と、上記基板と上記撮像素子とを電気的に接続するワイヤと、上記結像レンズ部を露出させて上記ワイヤを封止する封止樹脂とを備えたことを特徴とする撮像装置。

【請求項 9】 基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも 1 つの結像レンズ部を有し、表面をテーパ状に形成した光学素子と、上記結像レンズ部を除き、上記撮像素子及び上記光学素子を樹脂封止する封止材とを備えたことを特徴とする撮像装置。

【請求項 10】 上記光学素子のテーパ状の部分に凹凸を形成したことを特徴とする請求項 9 に記載の撮像装置。

【請求項 11】 基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも 1 つの結像レンズ部を有する光学素子と、上記撮像素子及び上記光学素子の側面部に設けられたチクソ性が高い第 1 の

封止樹脂と、上記結像レンズ部を除く上記光学素子の表面に設けられたチクソ性の低い第 2 の封止樹脂とを備えたことを特徴とする撮像装置。

【請求項 12】 基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも 1 つの結像レンズ部を有する光学素子と、この光学素子の上記結像レンズ部の周囲に凹部を形成し、この凹部に配設された遮光性部材と、この遮光性部材と連続して上記光学素子の表面及び側面と上記撮像素子の側面を封止する封止樹脂とを備えたことを特徴とする撮像装置。

【請求項 13】 上記遮光性部材に接続し、上記結像レンズ部を覆うように赤外光除去部材を設けたことを特徴とする請求項 12 に記載の撮像装置。

【請求項 14】 上記遮光性部材の上面をテーパ状に形成して絞り機能を付与したことを特徴とする請求項 12 に記載の撮像装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、撮像素子と結像レンズ部を有する光学素子とを一体化した撮像装置及びその製造方法に関するものである。

【0002】

【従来の技術】従来、この種の撮像装置としては、例えば特開平 9-284617 号公報に記載されたものがあった。その公報には、結像レンズ部と複数の脚部とからなる光学素子を基板上に載置された撮像素子である CCD ベアチップ上に配置したものである。それらの脚部を CCD ベアチップの上面の角部に当接させることにより、結像レンズ部と CCD ベアチップに設けた受光面の焦点方向を含む相対位置が所定位置になるように構成されている。

【0003】

【発明が解決しようとする課題】しかしながら、従来のこの種の撮像装置においては、固定焦点レンズを用いており、結像レンズ部と撮像素子上の受光面との焦点方向を含む相対位置精度を確保するため、光学素子に複数の脚部を設ける必要があった。したがって、従来の撮像装置では、レンズ構造が複雑で、パッケージ型であるため、小型化が困難あるという課題があった。

【0004】この発明は、かかる課題を解決するためになされたものであり、撮像素子及び結像レンズ部を有する光学素子と筐体をも一体化して、又は撮像素子及び光学素子を樹脂封止して小型化を図る新規な撮像装置を提供することを目的とする。

【0005】

【課題を解決するための手段】この発明の請求項 1 に係る撮像装置は、撮像素子と、この撮像素子に光を結像させる結像レンズ部を有し、上記撮像素子と一体化された光学素子と、この光学素子の上記結合レンズ部側に設けられた結合部と、上記結像レンズ部に対応する部分に開

(3)

3

口部を形成し、この開口部を上記結像レンズ部に配置して上記結合部を固定する固定部を有する筐体とを備えたものである。

【0006】この発明の請求項2に係る撮像装置は、上記結合部を段付き形状の突起部であることを特徴とする請求項1に記載のものである。

【0007】この発明の請求項3に係る撮像装置は、撮像素子と、突部が設けられ、この突部上に光を結像させる結像レンズ部を有する上記撮像素子と一体化された光学素子と、上記結像レンズ部に対応する部分に開口部を形成するとともに、上記突部を嵌め込む嵌合部を形成した筐体とを備えたものである。

【0008】この発明の請求項4に係る撮像装置は、上記突部と上記嵌合部とを接着したことを特徴とする請求項3に記載のものである。

【0009】この発明の請求項5に係る撮像装置は、上記開口部に赤外光を除去する赤外光除去部材を配設したことを特徴とする請求項3に記載のものである。

【0010】この発明の請求項6に係る撮像装置は、基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも1つの結合レンズ部を有する光学素子と、上記基板と上記撮像素子とを電気的に接続するワイヤと、上記結像レンズ部を露出させて上記ワイヤを封止する封止樹脂とを備えたものである。

【0011】この発明の請求項7に係る撮像装置は、上記結像レンズ部を除き、上記封止樹脂の外形を曲面状に形成したことを特徴とする請求項6に記載のものである。

【0012】この発明の請求項8に係る撮像装置は、基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、外形が曲面状の透明部材と、この透明部材上に設けられた少なくとも1つの結像レンズ部と、上記基板と上記撮像素子とを電気的に接続するワイヤと、上記結像レンズ部を露出させて上記ワイヤを封止する封止樹脂とを備えたものである。

【0013】この発明の請求項9に係る撮像装置は、基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも1つの結像レンズ部を有し、表面をテープ状に形成した光学素子と、上記結像レンズ部を除き、上記撮像素子及び上記光学素子を樹脂封止する封止材とを備えたものである。

【0014】この発明の請求項10に係る撮像装置は、上記光学素子のテープ状の部分に凹凸を形成したことを特徴とする請求項9に記載のものである。

【0015】この発明の請求項11に係る撮像装置は、基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも1つの結像レンズ部を有する光学素子と、上記撮像素子及び上記光学素子の側面部に設けられたチクソ性が高い第1の封止樹脂と、上記結像レンズ部を除く上記光学素子の表面に設けられたチ

4

クソ性の低い代2の封止樹脂とを備えたものである。

【0016】この発明の請求項12に係る撮像装置は、基板と、この基板上に設けられた撮像素子と、この撮像素子上に設けられ、少なくとも1つの結像レンズ部を有する光学素子と、この光学素子の上記結像レンズ部の周囲に凹部を形成し、この凹部に配設された遮光性部材と、この遮光性部材と連続して上記光学素子の表面及び側面と上記撮像素子の側面を封止する封止樹脂とを備えたものである。

【0017】この発明の請求項13に係る撮像装置は、上記遮光性部材に接続し、上記結像レンズ部を覆うように赤外光除去部材を設けたことを特徴とする請求項12に記載のものである。

【0018】この発明の請求項14に係る撮像装置は、上記遮光性部材の上面をテープ状に形成して絞り機能を付与したことを特徴とする請求項12に記載のものである。

【0019】

【発明の実施の形態】この発明の実施の形態1について、図1(a) (b) (c) (d) (e) を用いて説明する。図1(a)はこの発明の実施の形態1を示す外形平面図、図1(b)はその筐体の外形側面図、図1

(c)はこの発明の実施の形態1に係る一体化した撮像素子・光学素子と筐体とを組み立てる前の撮像素子・光学素子と筐体の断面図、図1(d)は撮像素子・光学素子と筐体を組み立てた後の部分断面図、図1(e)はその全体構成の断面図である。図1において、2は受光部を有する撮像素子、3は少なくとも1つの結像レンズ部3aを有し、かつ、結像レンズ部3aと離隔した位置に形成した凸部3gを有する光学素子であって、この光学素子3は撮像素子2と一体化をしている。7は撮像素子2と光学素子3とを組み合わせて一体化した一体型撮像装置を組み込む筐体であって、筐体7には開口部7aと光学素子3の凸部3gと対向する位置にこれと対応する構造の溝部7bを形成している。図1(c)、(d)に示すように、撮像素子2と光学素子3を一体化して光学素子3の凸部3gと筐体7の溝部7bを嵌合させて一体化している。このとき、結像レンズ部3aは、筐体7の開口部7aに入り込むように外部に覗かしている。ここで、光学素子3の凸部3gと筐体7の溝部7bは嵌合して組み立てられるように対応した形状としている。また、筐体7の外形については、図1(b) (e)に示すように、その周辺部において、結像レンズ部3aとは反対側に折り曲げた構成にし、その折り曲げた端部は撮像素子2の光学素子3と反対側の底部と略同一又はやや外側になるように構成している。なお、上記の折り曲げた端部の形状は円形状としている。

【0020】図2(a) (b)は、それぞれこの発明の実施の形態2を示す正面図及び側面図である。また、図3(a) (b)はそれぞれこの発明の実施の形態3を示

(4)

5

す正面図及び側面図である。図2では光学素子3上の凸部3gを四角形としたものである。図3では光学素子3上の凸部3gを四角形状の2段構成としたもので、上側を下側よりも一辺の長さを小さくして図示しない筐体7の開口部7aが下側の四角形の上面に当たるようにしている。このため、下側の四角形の高さは結像レンズ部3aの突出高さと同一又は若干高く形成している。なお、図2及び図3には図示していないが、凸部3gに対応するように筐体7の溝部7bの形状は四角形とすることは勿論である。

【0021】さらに、この発明の実施の形態4について図4(a) (b) (c) を用いて説明する。図4(a)

(b) は、それぞれこの発明の実施の形態1に係る撮像装置の正面図及び側面図である。図4(c) はこの発明の実施の形態1に係る撮像装置の筐体を付加したときの構成を示す側面図である。図4において、図1等と同一符号は同一又は相当部分を示す。図4においては、光学素子3上に形成する凸部3gを複数個設けている。

【0022】このように、これらの実施の形態2、3又は4によれば、撮像素子2と光学素子3とを一体化した撮像装置が筐体7に対して回転しないように構成できる。また、光学素子3上の凸部3gと筐体7の溝部7bが嵌合される個所を接着して一体化してもよい。なお、これらの実施の形態では、光学素子3上に凸部3gを、筐体7上に溝部7bを設けたが、それに限るものではなく、凸部3gの断面形状も○型及び□型に限るものではない。

【0023】このように、この発明の実施の形態1乃至4に係る撮像装置は、筐体7に組み込むための部品が光学素子2と一体化しているため、省部品化が可能になり、筐体7との組み立てが容易になる。また、一般には、撮像装置は、撮像素子及び光学素子が基板上に固定され、厳密にいえば筐体とは独立して配置されているが、この発明の実施の形態1に係る撮像装置によれば、一体化した撮像素子及び光学素子を必ずしも基板上に固定する必要はなく、撮像装置の動作や信号処理のやり取りをするための信号系のインターフェースを接続するだけよい。したがって、基板に撮像素子を固定するための固定部が省スペース化でき、小型化・設計自由度の拡大を実現することができる。

【0024】次に、この発明の実施の形態5について図5(a) (b) (c) を用いて説明する。図5(a)

(b) は、それぞれこの発明の実施の形態5に係る撮像装置の正面図及び側面図である。図5(c) はこの発明の実施の形態5に係る撮像装置の筐体を付加したときの構成を示す側面図及び一部拡大図である。図5において、図1と同一符号は同一又は相当部分を示す。図5(a) (b) に示すように、光学素子3は突出部3hを有し、結像レンズ部3aは突出部3h上に形成している。この突出部3hは、図5(c) に示すように、筐体

6

7の開口部7aの周辺部における内側に形成した勘合部7cに嵌め込まれている。このとき、勘合部7cを形成するための筐体7の内側に突出する部分の高さは、突出部3hの高さと略同一又はやや低いとする。

【0025】図5(c)において、8は接着剤で、筐体7の内側に突出する部分と光学素子3の突出部3h等との間に設けて光学素子3と筐体7とを一体化を実現している。また、結像レンズ部3aは、図5(c)に示すように、開口部7aが外部に臨んでいる。このようにして、一体化した撮像素子2と光学素子3を筐体7に組み込んだとき、筐体7との相対位置が決められ、かつ、組み立て時の作業が容易となる。また、光学素子3上に突出部3hを設けることにより、光学素子3は段付形状になることから、高さ方向の相対位置も決められる。なお、撮像装置製品においては、光学素子3上の結像レンズ部3aと筐体7上の開口部7aとの相対位置関係は、撮像装置が被写体を光学情報として取り込むためその相対位置は重要であるが、この実施の形態5では、その位置合わせを容易にすることができる。

【0026】次に、この発明の実施の形態6について図6(a) (b) を用いて説明する。図6(a) (b) は、それぞれこの発明の実施の形態6に係る撮像装置の部分拡大断面図である。図6(a) (b)において、図5と同一符号は同一又は相当部分を示す。図6に示す撮像装置は、基本的には図5(c)に示すものと同様であるが、特徴とするところは結像レンズ部3aの周縁部における筐体7に切欠き部7dを形成し、この切欠き部7dに赤外光除去機能を有する赤外光除去部材9を装着している。筐体7の開口部7aの周縁部は、入射光の絞り効果を有するようにテーパ形状7eに形成している。この実施の形態6では、光学素子3の結像レンズ部3aの周縁部に設けられた突出部3hとそれに対応する筐体7に設けられた嵌合部7cとで組み合わせ、さらにその嵌合部を接着剤8により固定して、一体化した光学素子3と撮像素子2とを筐体7に一体化・固定化をしている。

【0027】このようにすることにより、この実施の形態6に係る撮像装置は、接着剤8を介して光学素子3が筐体7に一体化されるため、何らかの原因で筐体7の開口部7aの外側から光学素子3を筐体7の内側に押し込むもうとする外力が働いたとき、その外力は光学素子3と筐体7の接着剤8の接着力により吸収されるため、外力による撮像素子2へ直接加わる衝撃を緩和することができる。また、図6(b)は、筐体7の開口部7aの周縁部におけるテーパ形状7eにより、入射光に対する絞り効果を有する。このように、撮像装置が組み込まれる製品の筐体上に絞り機能をもたせることにより、撮像装置側には絞り機能をもたせる必要がなくなり、撮像装置の工数を低減するとともに、工程品質が向上し低コスト化できる。

【0028】また、筐体7の開口部7aに赤外光除去効

(5)

7

果を有するプレートを配置しているため、撮像装置側には赤外光除去手段を設ける必要がなくなり、撮像装置の作製工数を低減するとともに、工程品質が向上し低コスト化できる。すなわち、品質変動要素が大きい光学素子一体型撮像装置工程の部品点数を省部品化し、工数削減するとともに、不良発生機会を減少することができ、工程品質を安定化・向上させることができる。なお、赤外光除去機能を有する部品9を硬質の材料にしてもよい。それにより、何らかの原因で筐体7の開口部7aの外側から光学素子3を筐体7の内側に押し込もうとする外力が働いたとき、撮像装置に与える負荷を軽減するとともに、光学素子3の結像レンズ部3aに傷等が発生することを防ぐことができる。

【0029】次に、この発明の実施の形態7について図7を用いて説明する。図7はこの発明の実施の形態7に係る撮像装置の構成を示す構成図である。図7において、1は基板、2は撮像素子、3は少なくとも1つの結像レンズ部3aを有する光学素子、10は基板1と撮像素子2をワイヤーボンディングにより電気的に接続する金ワイヤ、11は金ワイヤ10を封止する封止樹脂である。撮像素子2は基板1上に実装され、金ワイヤ10によりワイヤーボンディング方法で電気的に接続されている。光学素子3は撮像素子2上に接着剤により仮固定されるが、封止樹脂11により基板上に一体化・固定される。

【0030】このような構成にすれば、封止樹脂11により吸湿及び異物進入から撮像装置を保護でき、外力に対する保護の機能も有しながら、光学素子3を撮像素子2と一体化・小型化を実現できる。なお、封止樹脂11は遮光性の樹脂としてもよい。そうすれば、前述の効果を達成できるほか、結像レンズ部3a以外から撮像素子2上の受光面への光線の進入を防ぐことができる。パッケージ機能を有する部品を不要とし、省部品化・小型化も可能となる。また、この発明の実施の形態7は、使用される封止樹脂の材質を限定するものではなく、例えばシリコン系の弾力性樹脂でも可能であるほか、エポキシ系の硬質樹脂でも可能である。封止樹脂を構成する方法を限るものではなく、例えばディスペ ns方法で構成してもよいし、成形方法によって構成してもよい。撮像素子2と基板1を金ワイヤ10により電気的に接続された構成について述べたが、金ワイヤに限るものでもない。

【0031】また、図7において光学素子3上の結像レンズ部3aを除いた封止樹脂11の外形を曲面状に形成されている。例えば、液状の遮光性封止樹脂を用いて構成する場合、光学素子3の表面上に角張ったエッジ部があると、そのエッジ部を境に封止樹脂11が流れ落ち、現像としてそのエッジ部付近だけ封止樹脂11の厚みが薄くなり、光学素子3のエッジ部から封止樹脂11を通過して光が撮像素子2上まで透過するという問題があった。しかしながら、封止樹脂11の形状を、図7のよう

(5)

8

に光学素子3の結像レンズ部3a以外の外形表面部を滑らかな曲線形状とすることにより、前述の角張ったエッジ部がないため、部分的に封止樹脂11の膜厚が薄くなることがなく、遮光機能を維持することもできる。

【0032】次に、この発明の実施の形態8について、図8、図9(a) (b) (c)、図10、図11(a) (b)を用いて説明する。図8はこの発明に実施の形態8に係る撮像装置の構成を示す構成図、図9(a) (b) (c)は、この発明の実施の形態に係る光学素子の平面図、正面図及び側面図である。図10はこの発明の実施の形態8に係る撮像装置の別の構成を示す構成図、図11(a) (b)はそれぞれこの発明の実施の形態8に係る撮像装置の平面図及び部分拡大図を附加した側面図である。図8、図9(a) (b) (c)、図10、図11(a) (b)において、図7と同一符号は同一又は相当部分を示す。図8、図10においては、光学素子3の結像レンズ部3a以外における表面外形部分を滑らかな曲面形状3Iとした点に特徴がある。また、図10ではワイヤーボンディング部を覆うように光学素子3に傘形状3Jを形成している。また、図11(a) (b)においては、光学素子3の結像レンズ部3a以外における表面外形部分に傾斜を持ったテーオア形状3Kを形成した形状としている。

【0033】図8において、光学素子3の結像レンズ部3a以外の外形表面部は、図9(a) (b) (c)に示すように角張ったエッジ部を排除した丸みをもった曲面形状に仕上げている。ワイヤーボンドにより基板1と電気的に接続した撮像素子2上に、光学素子3を仮固定し、封止樹脂11により電気的結合部を封止しながら、光学素子3を基板1及び撮像素子2と一体化・固定して撮像装置を構成する。この発明の実施の形態8に係る撮像装置も、液状の遮光性封止樹脂を用いて構成する場合、実施の形態7と同様の問題があつたが、光学素子3の表面上に角張ったエッジ部があると、そのエッジ部を境に封止樹脂11が流れ落ち、現像としてそのエッジ部付近だけ封止樹脂11の厚みが薄くなり、光学素子3のエッジ部から封止樹脂11を通過して光が撮像素子2上まで透過するという問題があつた。しかしながら、光学素子3を図9のように光学素子3の結像レンズ部3a以外の外形表面部を滑らかな曲線形状とすることにより、前述の角張ったエッジ部が内ため、部分的に封止樹脂の膜厚が薄くなることがなく、遮光機能を維持することもできる。

【0034】また、図11(a)に示すように、撮像素子2の上面角部付近において光学素子3のテープ形状3kの裾部分におけるエッジ角を大きくすると、遮光性の封止樹脂11がそのエッジ部でその膜厚が薄くなることを緩和することができ、遮光機能を維持できる。図11(b)の部分拡大図に示すように、光学素子3の結像レンズ部3a以外の表面外形部分に微細な凹凸3Lを形成

(6)

9

している。これにより、光学素子3の表面における封止樹脂11の流動抵抗を付与して、封止樹脂11の流れ出しを防止して封止樹脂11による濃淡ばらつきの発生を少なくし、遮光機能を向上させることができる。

【0035】また、図11(b)においては、光学素子3の凹凸3Lを階段状に形成したが、それに限るものではなく、例えば擦りガラス等の擦り状にしてもよく、封止樹脂11と光学素子3の界面に流体の流動抵抗を設けるその他の手段でもよい。また、樹脂封止部の形成時には、液状であって、硬化後は弾力性のあるシリコン系の封止樹脂を用い、金ワイヤ10を覆うような傘形状3Jを設けてもよい。このようにすると、弾力性のある封止樹脂を用いる場合でも、光学素子3の傘形状3Jにより、金ワイヤ10を外力からの保護機能を強化でき、外力に対する強度を向上させることができる。なお、硬質の封止樹脂を用いる場合に、傘形状3Lに至っても製品信頼性が向上することができる。

【0036】次に、この発明の実施の形態9について、図12を用いて説明する。図12は、この発明の実施の形態9に係る撮像装置の構成を示す構成図である。図12において、図11と同一符号は同一又は相当部分を示すため、それらの説明は省略する。図12において、封止樹脂11は、チクソ性の高い封止樹脂11aと低粘土の封止樹脂11bとで構成している。光学素子3及び撮像素子2を基板1と一体化している封止樹脂11を、光学素子3の上面角部から基板1に至るまでの部分をチクソ性が高く、かつ、高粘度の封止樹脂11aにより、光学素子3の上面部分は封止樹脂11aよりチクソ性が低く、かつ、低粘度の封止樹脂11bで構成している。このようにすると、封止樹脂11aは高チクソ性・高粘度のため、封止樹脂自体の形状を維持することができ、封止樹脂部が流れ出さず、遮光機能を維持できる。なお、封止樹脂11bも、高チクソ性の封止樹脂でもよい。

【0037】次に、この発明の実施の形態10に係る撮像装置について、図13(a)(b)及び図14(a)(b)並びに図15を用いて説明する。図13(a)(b)及び図14(a)(b)は、この実施の形態10に係る撮像装置の正面図及び部分的拡大図を付加した側面図、図15は図14(b)に相当する部分についての別の実施例を示す部分拡大図である。図13及び図14において、図12と同一符号は同一又は相当部分を示すため、それらの説明は省略する。図13及び図14においては、光学素子3の結像レンズ部3aの極周縁部における外形部に凹部3mを形成している。図14においては光学素子3に形成した凹部3mに遮光性の部品12を配置している。この遮光性の部品12は、図14(b)の部分拡大図に示すように、入射光に対する絞り機能を有する形状12aを形成している。また、図15では、光学素子3の結像レンズ部3aの周囲付近に遮光性の部品12を配置し、その遮光性の部品12に赤外光除去機

10

能を有する部品9を嵌合させている。

【0038】このように、図13では、光学素子3の結像レンズ部3aの極周縁部に凹部3mを設け、封止樹脂11は光学素子3と撮像素子2と基板1とを一体化・固定している。このとき、封止樹脂11を光学素子3に塗布する際に、塗布量のばらつきにより、光学素子3の結像レンズ部3a付近における形状が結像レンズ部3aの周縁形状に対して歪んだり、結像レンズ部3aのレンズ面上に付着するなどの不具合を防止するため、図13

10 (a)(b)に示すように、光学素子3に設けられた凹部3mに封止樹脂11の溜まり部を形成したものである。したがって、封止樹脂11の塗布形状が光学素子3の結像レンズ部3aの周縁部を正確に封止し、結像レンズ部3aのレンズ面上に付着することも防ぐことができる。

【0039】また、図14では、図13に示す凹部3mにその形状と対応し嵌合組立て可能な寸法の遮光性の部品12を凹部3mに光学素子3と当接しながら嵌合組立てている。こうして、封止樹脂11の塗布形状が光学素子3の結像レンズ部3aの周縁形状に影響を与えず、結像レンズ部3aの極周縁部は遮光性の部品12によって確実に遮光され、封止樹脂11の結像レンズ部3aのレンズ面上への付着を確実に防止できるとともに、封止樹脂11の塗布作業を容易、かつ、安定した品質とすることができる。また、図14(b)の部分拡大図に示すように、遮光性の部品12における結像レンズ3aの周縁部と接近している部分を12aのような形状とすることにより、入射光の絞り機能を設けている。

【0040】なお、この実施の形態10では、絞り機能を有する遮光性の部品12aと赤外除去効果を有する部品9を別々に設けたが、それらの両方を構成してもよい。こうすれば、封止樹脂11により光学素子3、撮像装置2及び基板1を一体化・固定する場合に、その封止樹脂11により結像レンズ3aの周縁部において光学的な性能を損なうことなく生産でき、実施の形態7の場合における効果をも併せもつことができる。

【0041】

【発明の効果】この発明の請求項1に係る撮像装置によれば、光学素子の結合レンズ部側に設けた結合部と筐体に設けた固定部とにより、一体化された撮像素子と光学素子を上記筐体に一体化することができる。

【0042】この発明の請求項2に係る撮像装置によれば、上記突起部に段付き形状を形成したことから、光学素子の結像レンズ部と筐体の開口部との相対位置合わせが容易になる。

【0043】この発明の請求項3に係る撮像装置によれば、光学素子に形成した突部に結像レンズ部を設け、上記突部を筐体の嵌合部に嵌め込む構成としたことから、一体化した撮像素子及び光学素子と筐体との相対位置合わせが容易になる。

50

(7)

11

【0044】この発明の請求項4に係る撮像装置は、上記突部と上記嵌合部とを接着することにより、容易に一体化した撮像素子及び光学素子と筐体との一体化をすることができる。

【0045】この発明の請求項5に係る撮像装置は、上記筐体の上記結像レンズ部に対応する部分に開口部を設け、この開口部に赤外光を除去する赤外光除去部材を配設することにより、赤外光を有効に除去することができる。

【0046】この発明の請求項6に係る撮像装置は、基板上の撮像素子に結合レンズ部を有する光学素子を配設し、上記基板と上記撮像素子とをワイヤにより電気的に接続して樹脂封止するため、吸湿及び異物進入を防止し、撮像素子及び光学素子を基板に一体化・固定化することができる。

【0047】この発明の請求項7に係る撮像装置は、上記結像レンズ部を除き、上記封止樹脂の外形を曲面形状にしたことから、部分的に封止樹脂の膜厚が薄くなることがなく、遮光機能を維持することができる。

【0048】この発明の請求項8に係る撮像装置は、基板上の撮像素子上に設けられた曲面状の透明部材に少なくとも1つの結像レンズ部を設け、上記基板と上記撮像素子とをワイヤにより電気的に接続し、上記結像レンズ部を露出させて上記ワイヤを樹脂封止することから、部分的に封止樹脂の膜厚が薄くなることがなく、遮光機能を維持することができる。

【0049】この発明の請求項9に係る撮像装置は、基板上の撮像素子にワイヤボンディング部を覆うようにテーパ部を形成した光学素子を設け、この光学素子の結像レンズ部を除いた表面部分の上記撮像素子及び上記光学素子を樹脂封止したことから、ワイヤボンディング部における外力に対する強度を向上させ、製品の信頼性を向上させることができる。

【0050】この発明の請求項10に係る撮像装置は、上記光学素子のテーパ状の部分に凹凸を形成したことから、封止樹脂の流れ出しを防止して封止樹脂による濃淡ばらつきの発生を少なくし、遮光機能を向上させることができます。

【0051】この発明の請求項11に係る撮像装置は、基板上の撮像素子と結像レンズ部を有する光学素子との側面部にチクソ性が高い第1の封止樹脂を設け、かつ、上記結像レンズ部を除く上記光学素子の表面にチクソ性の低い第2の封止樹脂を設けたので、封止樹脂自体の形状を維持することができる。

【0052】この発明の請求項12に係る撮像装置は、光学素子の結像レンズ部の周囲に凹部を形成し、この凹部に遮光性部材を配設して上記光学素子の表面及び側面と上記撮像素子の側面を封止樹脂により封止するため、上記結像レンズ部の周縁部を確実に封止することができ、入射光の絞り機能をもたせることができる。

12

【0053】この発明の請求項13に係る撮像装置は、光学素子の結像レンズ部を覆うように赤外光除去部材を設けたので、赤外光を有効に除去することができる。

【0054】この発明の請求項14に係る撮像装置は、光学素子の結像レンズ部の周縁部における遮光性部材の上面をテーパ状に形成したので、絞り機能をもたせることができる。

【図面の簡単な説明】

【図1】(a)はこの発明の実施の形態1を示す外形平面図、(b)はその筐体の外形側面図、(c)はこの発明の実施の形態1に係る一体化した撮像素子・光学素子と筐体とを組み立てる前の撮像素子・光学素子と筐体の断面図、(d)は撮像素子・光学素子と筐体を組み立てた後の部分断面図、(e)はその全体構成の断面図である。

【図2】(a)(b)は、それぞれこの発明の実施の形態2を示す正面図及び側面図である。

【図3】(a)(b)はそれぞれこの発明の実施の形態3を示す正面図及び側面図である。

【図4】(a)(b)は、それぞれこの発明の実施の形態1に係る撮像装置の正面図及び側面図、(c)はこの発明の実施の形態1に係る撮像装置の筐体を付加したときの構成を示す側面図である。

【図5】(a)(b)は、それぞれこの発明の実施の形態5に係る撮像装置の正面図及び側面図、(c)はこの発明の実施の形態5に係る撮像装置の筐体を付加したときの構成を示す側面図及び一部拡大図である。

【図6】(a)(b)は、それぞれこの発明の実施の形態6に係る撮像装置の部分拡大断面図である。

【図7】この発明の実施の形態7に係る撮像装置の構成を示す構成図である。

【図8】この発明の実施の形態8に係る撮像装置の構成を示す構成図である。

【図9】(a)(b)(c)は、それぞれ図8に示す撮像装置に係る光学素子の外形を示した平面図、正面図及び側面図である。

【図10】この発明の実施の形態8に係る撮像装置の構成を示す構成図である。

【図11】(a)(b)はそれぞれこの発明の実施の形態8に係る撮像装置の平面図及び部分拡大図を付加した側面図である。

【図12】この発明の実施の形態9に係る撮像装置の構成を示す構成図である。

【図13】(a)(b)は、それぞれこの実施の形態10に係る撮像装置の正面図及び部分的拡大図を付加した側面図である。

【図14】(a)(b)は、それぞれこの実施の形態10に係る撮像装置の正面図及び部分的拡大図を付加した側面図である。

【図15】図14(b)に相当する部分についての別

(8)

13

の実施例を示す部分拡大図である。

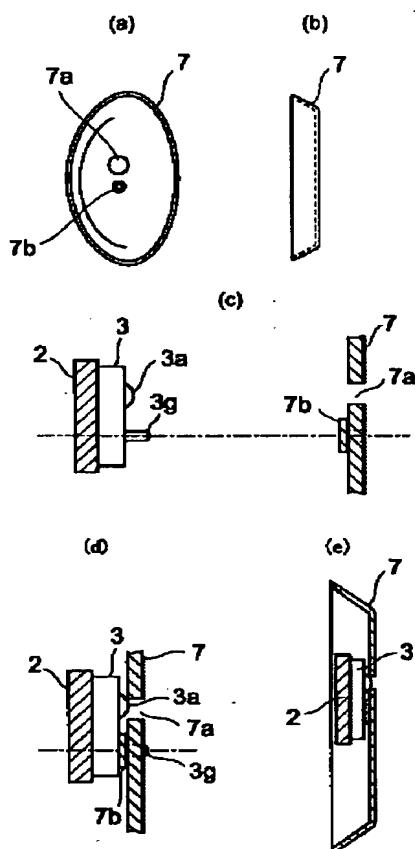
【符号の説明】

1 … 基板、 2 … 摄像素子、 3 … 光学素子、 3 a … 結像レンズ部、 3 g … 凸部、 3 h … 突出部、 3 J … 傘形状、 3 k … テーパ部、 3 L … 凹凸、 3 m … 凹部、 7 … 筐体、 7

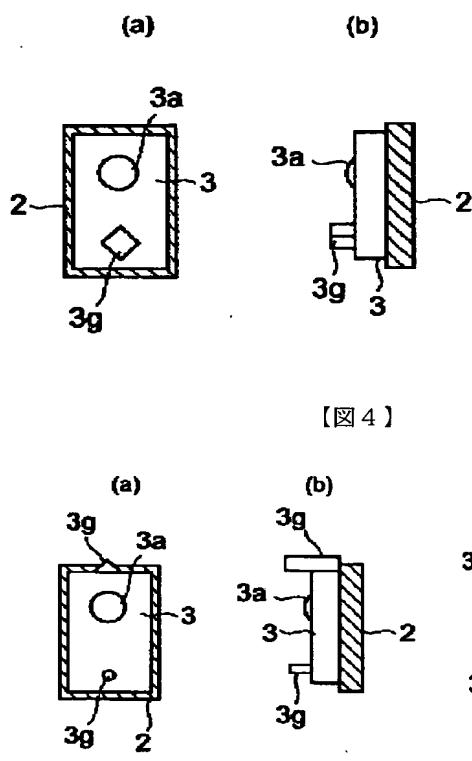
14

a … 開口部、 7 b … 溝部、 7 c … 嵌合部、 7 d … 切欠き部、 8 … 接着剤、 9 … 赤外光除去部材、 10 … 金ワイヤ、 11 … 封止樹脂、 11 a … 高粘度の封止樹脂、 11 b … 低粘度の封止樹脂、 12 … 遮光性…の部品、 12 a … 絞り形状

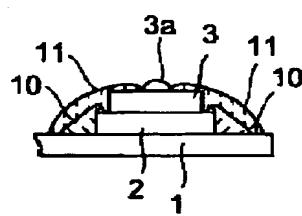
【圖 1】



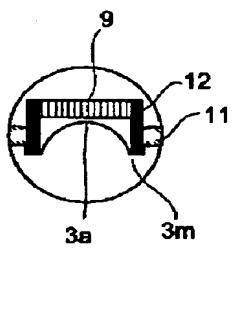
【図2】



【図7】

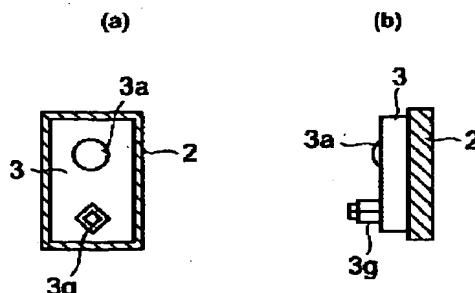


【図15】

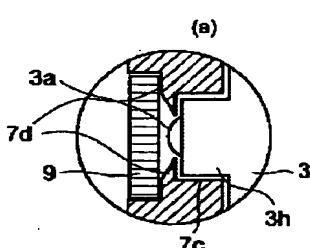


【図 6】

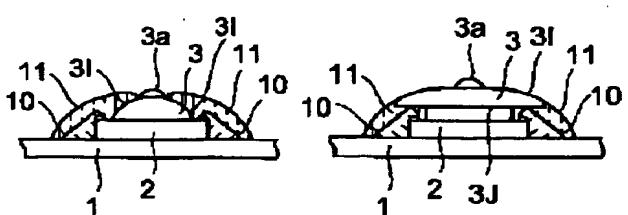
[図3]



[圖 8]

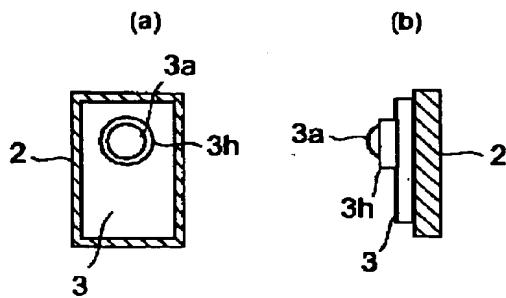


【図10】

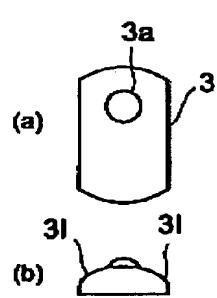


(9)

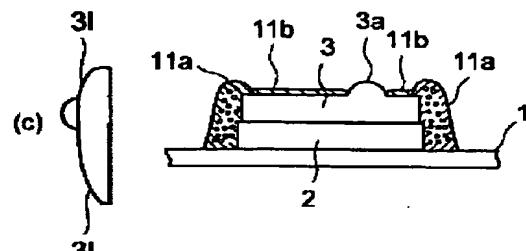
【図5】



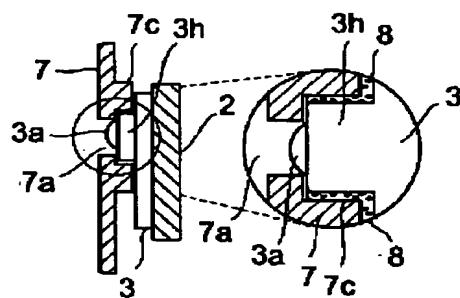
【図9】



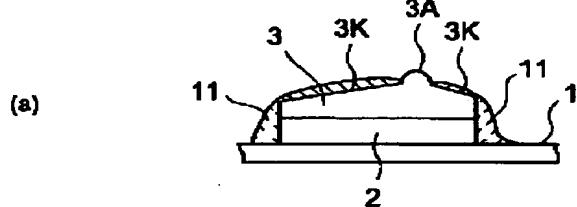
【図12】



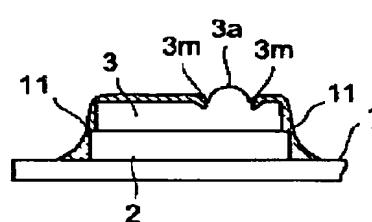
(c)



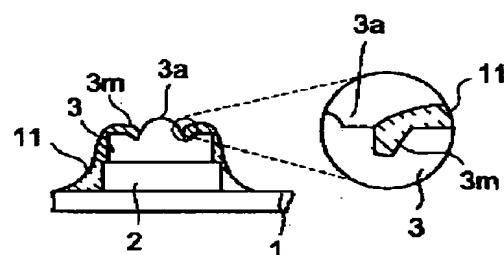
【図11】



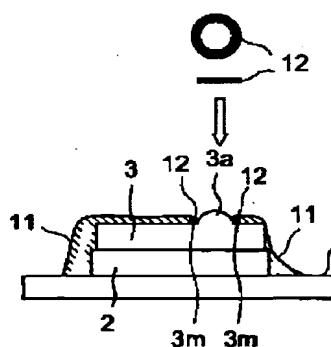
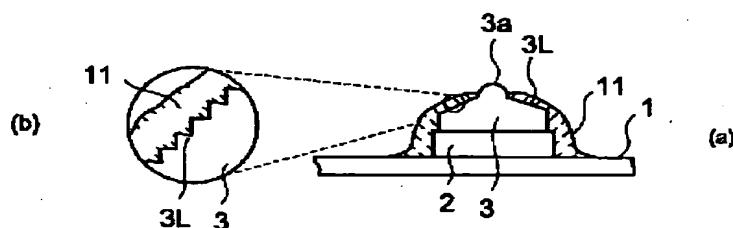
【図13】



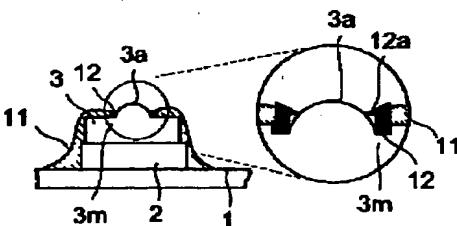
(b)



【図14】



(b)



**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.